Docket No.: 12810-00322-US1
(PATENT)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of:
Tim Jungkamp et al.

Application No.: 10/586,470 Confirmation No.: 4266

Filed: July 18, 2006 Art Unit: 1626

For: METHOD FOR PRODUCING LINEAR PENTENENITRILE Examiner: J. R. Kosack

APPEAL BRIEF

MS Appeal Brief - Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

As required under § 41.37(a), this brief is filed more than two months after the Notice of Appeal filed in this case on November 28, 2011, and is in furtherance of said Notice of Appeal.

The fees required under § 41.20(b)(2), and any required petition for extension of time for filing this brief and fees therefor, are dealt with in the accompanying TRANSMITTAL OF APPEAL BRIEF.

This brief contains items under the following headings as required by 37 C.F.R. § 41.37 and M.P.E.P. § 1205.2:

I. Real Party In Interest
II Related Appeals and Interferences
III. Status of Claims
IV. Status of Amendments
V. Summary of Claimed Subject Matter
VI. Grounds of Rejection to be Reviewed on Appeal
VII. Argument

I. REAL PARTY IN INTEREST

The real party in interest for this appeal is:

BASF SE

II. RELATED APPEALS AND INTERFERENCES

The Decision and Opinion in USSN 10/586,452 (Appeal 2010-005701), may directly affect or be directly affected by or have a bearing on the Board's decision in this appeal.

III. STATUS OF CLAIMS

A. Total Number of Claims in Application

There are 20 claims pending in application.

B. Current Status of Claims

1. Claims canceled: None
2. Claims withdrawn from consideration but not canceled: 11-16
3. Claims pending: 1-10 and 17-20
4. Claims allowed: None
5. Claims rejected: 1-10 and 17-20

C. Claims On Appeal

The claims on appeal are claims 1-10 and 17-20

IV. STATUS OF AMENDMENTS

Applicant did not file an Amendment to the Claims After Final Rejection.

V. SUMMARY OF CLAIMED SUBJECT MATTER

The present invention as recited in independent claim 1 is concerned with a process for preparing 3-pentenenitrile. The process comprises the following process steps:

(a) isomerizing a reactant stream which comprises 2-methyl-3-butenenitrile over at least one dissolved or dispersed isomerization catalyst to give a stream 1 which comprises the at least one isomerization catalyst, 2-methyl-3-butenenitrile, 3-pentenenitrile and (Z)-2-methyl-2-butenenitrile, (please see pargraph [0012])

(b) distilling stream 1 at a pressure of 0.1 mbar to 100 bar to obtain a stream 2 as the top product which comprises 2-methyl-3-butenenitrile, 3-pentenenitrile and (Z)-2-methyl-2-butenenitrile, and a stream 3 as the bottom product which comprises the at least one isomerization catalyst, (please see pargraph [0013] and page 21, lines 16-18 of the specification)

(c) distilling stream 2 at a bottom temperature of 40 to 180°C and a pressure of 10 mbar to 500 mbar to obtain a stream 4 as the top product which, compared to stream 2, is enriched in (Z)-2-methyl-2-butenenitrile, based on the sum of all pentenenitriles in stream 2, and a stream 5 as the bottom product which, compared to stream 2, is enriched in 3-pentenenitrile and 2-methyl-3-butenenitrile, based on the sum of all pentenenitriles in stream 2, (please see pargraph [0014])

(d) distilling stream 5 at a pressure of 0.001 bar to 100 bar to obtain a stream 6 as the bottom product which comprises 3-pentenenitrile and a stream 7 as the top product which comprises 2-methyl-3-butenenitrile, the (Z)-2-methyl-2-butenenitrile-depleted 2-methyl-3-butenenitrile being recycled to step (a). (please see paragraphs [0015], [0152], [0153], [0154, [0161] and [0163]) and page 2, lines 34-35 of the specification.

With respect to claim 1, also please see Figures 1.

Claim 2 further recites that the reactant stream is obtained by the following process steps: (please see pargraph [0017])

(e) hydrocyanating 1,3-butadiene over at least one hydrocyanation catalyst using hydrogen cyanide to obtain a stream 8 which comprises the at least one hydrocyanation catalyst, 3-pentenenitrile, 2-methyl-3-butenenitrile, 1,3-butadiene and residues of hydrogen cyanide, (please see pargraph [0018])

(f) distilling stream 8 one or more times to obtain a stream 9 which comprises 1,3-butadiene, a stream 10 which comprises the at least one hydrocyanation catalyst, and a stream 11 which comprises 3-pentenenitrile and 2-methyl-3-butenenitrile, (please see pargraph [0019])

(g) distilling stream 11 to obtain a stream 12 as the bottom product which comprises 3-pentenenitrile, and a stream 13 as the top product which comprises 2-methyl-3-butenenitrile. (please see paragraph [0020]) With respect to claim 2, also please see Figures 6, 7 and 8.

Claim 3 further recites that process step (d) and (g) are carried out in the same distillation apparatus, in which case streams 6 and 12 and streams 7 and 13 coincide. (please see paragraph [0150])

Claim 4 further recites that process steps (c) and (g) are carried out in a common distillation column, in which case process step (d) is dispensed with, stream 2 from process step (b) and stream 11 from process step (f) are directed to process step (g), and, in process step (g), stream 4 is obtained as the top product comprising (Z)-2-methyl-2-butenenitrile, stream 12 as the bottom product comprising 3-pentenenitrile and stream 13 as a side draw stream comprising 2-methyl-3-butenenitrile. (please see paragraph [0151])

Claim 5 further recites that the at least one isomerization catalyst obtained in stream 3 in process step (b) is recycled into process step (a). (please see paragraphs [0152], [0153], [0154, [0161] and [0163]).

Claim 6 further recites that process steps (b) and (c) are carried out together in one distillation apparatus, in which case stream 3 which comprises the at least one isomerization catalyst is obtained as the bottom product, stream 4 which comprises (Z)-2-methyl-2-butenenitrile as the top product, and stream 5 which comprises 3-pentenenitrile and 2-methyl-3-

butenenitrile at a side draw of the column. (please see paragraphs [0152], [0153], [0154, [0161] and [0163]).

Claim 7 further recites that process steps (a), (b) and (c) are carried out together in one distillation apparatus, in which case stream 4 which comprises (Z)-2-methyl-2-butenenitrile is obtained as the top product, and stream 5 which comprises 3-pentenenitrile and 2-methyl-3-butenenitrile at a side draw of the distillation apparatus, and the isomerization catalyst remains in the bottom of the distillation column. (please see paragraphs [0152], [0153], [0154, [0161] and [0163]).

Claim 8 further recites that the isomerization catalyst contains nickel(0), a trivalent phosphorus-containing compound which complexes nickel(0) as a ligand and, optionally, a Lewis acid. (please see paragraphs [0022], [0023], [0110], [0111], [0112], and [0104]).

Claim 9 further recites that the pressure and temperature in process step (b) are set so that the isomerization catalyst is less active than in process step (a) or is inactive. (please see paragraph [0137])

Claim 10 further recites that the hydrocyanation catalyst and the isomerization catalyst are identical. (see page 97, lines 5-6 of the specification).

Claim 17 further recites that step (b) is carried out at a pressure of 1 mbar to 6 bar and a temperature of 25-250°C at the bottom of the distillation apparatus and a temperature of – 15 to 200°C at the top of the distillation apparatus; step (c) is carried out at a temperature of – 15 to 200°C at the top of the distillation apparatus; and step (d) is carried out at a pressure of .001 bar to 100 bar and a temperature of -30 to 250°C at the bottom of the distillation apparatus and a temperature of –50 to 250°C at the top of the distillation apparatus. (please see paragraphs [0136], [0143] and [0148]).

Claim 18 further recites that step (b) is carried out at a pressure of 10 mbar to 500 mbar and a temperature of 40-180°C at the bottom of the distillation apparatus and a temperature of 5 to 150°C at the top of the distillation apparatus; step (c) is carried out at a temperature of 5 to 150°C at the top of the distillation apparatus; and step (d) is carried out at a pressure of .01 bar to 20 bar and a temperature of 50 to 200°C at the bottom of the distillation apparatus and a temperature of 0 to 180°C at the top of the distillation apparatus. (please see paragraphs [0136], [0143] and [0148]).

Claim 19 further recites that step (b) is at a temperature of 60-140°C at the bottom of the distillation apparatus and a temperature of 10 to 100°C at the top of the distillation apparatus; step (c) is carried out at a temperature of 60-140°C at the bottom of the distillation apparatus and a temperature of 10 to 100°C at the top of the distillation apparatus; and step (d) is carried out at a temperature of 60 to 180°C at the bottom of the distillation apparatus and a temperature of 15 to 160°C at the top of the distillation apparatus. (please see paragraphs [0136], [0143] and [0148]).

Claim 20 further recites that step (b) is carried out at a pressure of 1 mbar to 6 bar; and step (d) is carried out at a pressure of .001 bar to 100 bar. (please see paragraphs [0136], [0143] and [0148]).

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

A. Has the examiner established that Claims 1-10 and 17-20 are unpatentable under 35 U.S.C. 103(a) over U.S. Patent 3,356,748 to Drinkard et al., in view of U.S. Patent No. 6,242,633 to Fischer et al. and International Publication No. WO 02/26698 to Jungkamp et al.?

VII. ARGUMENT

A. Drinkard et al., Fischer et al., and Jungkamp et al. do not render unpatentable Claims 1-10 and 17-20 under 35 U.S.C. 103(a)

Claims 1-10 and 17-20 stand rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 3,536,748 to Drinkard et al., in view of U.S. Patent No. 6,242,633 to Fischer et al.[1] and International Publication No. WO 02/26698 to Jungkamp et al.[2] The cited references, fail to render obvious the claimed process of for producing 3-pentene nitrile.

The present invention describes a process for preparing 3-pentenenitrile by isomerizing streams comprising 2-methyl-3-butenenitrile. This forms a stream 1 which comprises an isomerization catalyst, 2-methyl-3-butenenitrile, 3-pentenenitrile and (Z)-2-methyl-2-butenenitrile. Later in the process, 3-pentenenitrile is obtained by distillation, 2-methyl-3-butenenitrile is recycled and a fraction in which (Z)-2-methyl-2-butenenitrile is enriched is discharged.

The process according to the invention differs essentially in the parameters in (c) of claim 1. The parameters in (c) of claim 1 are not described in any of the citations and cannot be derived from the citations or combination thereof without exercising inventive skill. In particular, claim 1 recites distilling stream 2 at a bottom temperature of 40 to 180°C and a pressure of 10 mbar to 500 mbar. It is evident from step (c) that the distillation of a stream 2 affords a top product 4 in which (Z)-2-methyl-2-butenenitrile is enriched compared to stream 2, based on the sum of all pentenenitriles. The bottom product obtained is a stream 5 in which 3-pentenenitrile and 2-methyl-3-butenenitrile is enriched compared to stream 2, based on the sum of all pentenenitriles.

[1] Fisher et al. is owned by BASF AG.

[2] WO 02/26698 is also owned by BASF AG and also names co-inventors common to the present application.

Removal of as much as possible (Z)-2-methyl-2-butenenitrile is necessary since it otherwise accumulates in the 2-methyl-3-butenenitrile because the boiling point difference from 2-methyl-3- butenenitrile is too small. The boiling point of (Z)-2-methyl-2-butenenitrile is 120-123°C at 1013 mbar and that of 2-methyl-3-butenenitrile is 124°C at 1013 mbar.

US Patent 3,865,865, cited in the present application, and which also refers to Drinkard (please see column 1, line 21), states that the distillative removal of 2-methyl-2- butenenitrile (2M2BN) from mixtures with 3-pentenenitrile and 2-methyl-3-butenenitrile (2M3BN) presents difficulties (please see column 1, lines 26 to 29). This evidences the conventional wisdom in the art of leading away from separation by distillation of nitriles having boiling points that are close together. Therefore, US Patent 3,865,865 proposes reacting the reaction mixture from the isomerization with aqueous alkali metal sulfite/alkali metal bisulfite solutions to give adducts which can be extracted from the reaction mixture with water. This process is very complex since it constitutes an additional process step.

As appreciated by the examiner, Drinkard fails to disclose the crucial distillation step (c) discussed above and distillation step (d), which recites distilling stream 5 at a pressure of 0.001 bar to 100 bar to obtain a stream 6 as the bottom product which comprises 3-pentenenitrile and a stream 7 as the top product which comprises 2-methyl-3-butenenitrile, the (Z)-2-methyl-2-butenenitrile-depleted 2-methyl-3-butenenitrile being recycled to step (a). By contrast to the present invention, Drinkard relates to the isomerization of 2-methyl-3-butenenitrile with a Ni [P $(OC_2H_5)_3]_4$ catalyst, so as to yield a liquid product stream which is then vacuum-distilled. The distillate includes 2-methyl-3-butenenitrile, 3-pentenenitrile, 2-methyl-2-butenenitrile and 4-pentenenitrile. The bottom stream composition is not further described, but one would expect it to contain the catalytic system and possible solvents.

As mentioned above, the subject matter of present claim 1 clearly differs from Drinkard, i.e., by the above-recited distillation steps (c) and (d). This presently claimed combination of features is neither known nor can be directly derived from Drinkard, either alone or in

combination with Fischer and Jungkamp. In particular, the Office has not shown that there would be an apparent reason to modify Drinkard with Fischer and Jungkamp[3].

Fischer[4] does not overcome the above deficiencies of Drinkard with respect to rendering unpatentable the present invention. Fischer fails to suggest the crucial distillation steps (c) and (d) according to the present invention. Fischer was relied upon for a disclosure of nickel isomerizaton catalysts.

WO 02/26698 to Jungkamp[5] does not overcome the above deficiencies of Drinkard with respect to rendering unpatentable the present invention. Jungkamp describes the distillative separation of certain pentenenitrile isomers in the presence of a liquid diluent, especially water. The diluent forms azeotropes with the pentenenitrile isomers. Jungkamp does disclose the distillative separation of (Z)-2-methyl-2-butenenitrile and 2-methyl-3-butenenitrile. Instead Jungkamp discloses the distillative separation of (E)-2-methyl-2-butenenitrile and 2-methyl-3-butenenitrile. However, the separation by distillation of (Z)-2-methyl-2-butenenitrile and 2-methyl-3-butenenitrile is much more complex than the separation by distillation of (E)-2-methyl-2-butenenitrile and 2-methyl-3-butenenitrile because the boiling points of (Z)-2-methyl-2-butenenitrile and 2-methyl-3-butenenitrile are closer together than those of (E)-2-methyl-2-butenenitrile and 2-methyl-3-butenenitrile. As mentioned above, the boiling point of (Z)-2-methyl-2-butenenitrile is 120-123°C at 1013 mbar and that of 2-methyl-3-butenenitrile is 124°C at 1013 mbar. In fact, if anything, Jungkamp actually leads away from the present invention since Jungkamp was aware of the need to separate (Z)-2-methyl-2-butenenitrile (please see, for instance, column 1, paragraph [00008]),but did not include it in any of the isomer mixtures subject to the processes discussed therein. This indicates that persons skilled in the art would not have adapted the disclosure of Jungkamp to separating (Z)-2-methyl-2-butenenitrile and 2-methyl-3-butenenitrile. Nothing in Jungkamp suggests that nitrile compounds having boiling

[3] In fact, the conclusion in the International Preliminary Report on Patentability was that the claims were novel, inventive and had industrial utility.

[4] Fischer is assigned to BASF, the assignee of this application and includes an inventor that is also a named inventor in this application.

[5] Jungkamp is assigned to BASF, the assignee of this application and includes named inventors that are also named inventors in this application.

points close together can be separated by distillation and contrary to the conventional wisdom in the art as expressed in US Patent 3,865,865, discussed above.

The separation in Jungkamp is based upon the addition of water as an entrainer. Working under vacuum is not a preferred separation method according to Jungkamp. Consequently, working under vacuum for separation of a mixture with boiling points much closer to each other than those of the mixtures disclosed in Jungkamp is not obvious in light of Jungkamp. Advantages of the method according to the present invention are the reduced energy expenditure, improved separation and the advantage that the product does not need to be dried.

With respect to pressure, Jungkamp states that the distillation can be performed at a pressure in the range from 1 to 200/kPa (0.01 to 2 bar), preferably 50 to 100 kPa (0.5 to 1 bar), especially at standard pressure (Jungkamp, page 5 lines 24 to 26). However, persons skilled in the art would not have performed the distillation under reduced pressure for at least the following reasons:

a) the preferred distillation at standard pressure leads away from working under reduced pressure

b) there are no working examples in Jungkamp for working under reduced pressure

c) the distillative separation of (Z)-2-methyl-2-butenenitrile and 2-methyl-3-butenenitrile is not described in Jungkamp.

In addition, pressure is not disclosed as a result-effective parameter. As set forth in MPEP §2144.05 II. (B), only result-effective variables can be optimized. Specifically, a particular parameter must first be recognized as a result-effective variable, i.e., a variable which achieves a recognized result, before the determination of the workable ranges of the variable might be characterized as routine experimentation or an obvious choice of expedients or design choice. Also, please see *In re Antonie*, 559 F.2d 618, 195 USPQ 6 (CCPA 1977). No such recognition is disclosed in the cited art.

Examples are compiled below regarding the pressure dependence of the distillative (Z)-2-methyl-2- butenenitrile/2-methyl-3-butenenitrile separation (please see WO 2005/73179, pages 23-24).

The following abbreviations are used:

T3PN	trans-3-pentenenitrile
C3PN	cis-3-pentenenitrile
4PN	4-pentenenitrile
2M3BN	2-methyl-3-butenenitrile
T2PN	trans-2-pentenenitrile
C2PN	cis-2-pentenenitrile
E2M2BN	(E)-2-methyl-2-butenenitrile
Z2M2BN	(Z)-2-methyl-2-butenenitrile
VSN	valeronitrile
VCH	4-vinylcyclohexene

The separation of the starting mixture comprising trans-3-pentenenitrile, 2-methyl-3-butenenitrile and (Z)- 2-methyl-2-butenenitrile as main components (Table 1) is performed in a distillation column with evaporator, total condenser and reflux divider. The distillation column has 15 theoretical plants. The return ratio m(removal)/m(return to column) is 50. The feed into the evaporator is at 10 kg/h into the bottom of the column; the removal at the top is at 0.05 kg/h.

Table 1

Constituent	Feed, % by weight
T3PN	58
C3PN	1
4PN	1
2M3BN	21
T2PN	0
C2PN	1
E2M2BN	1
Z2M2BN	16
VSN	0
VCH	1

Table 2

Example	Pressure (bar)	Bottom temperature °C	Top temperature °C	2M3BN in tops % by weight	Z2M2BN in tops % by weight
1	1.000	133	119	23	77
2	0.500	110	97	22	77
3	0.200	84	71	21	78
4	0.100	68	55	20	79
5	0.050	53	40	19	80
6	0.020	38	22	17	82

Examples 1 to 6 (Table 2) show that, with the same return ratio and same removal rates, the lower the pressure established in the column, the higher the efficiency of the separation of 2-methyl-3-butenenitrile and (Z)-2-methyl-2-butenenitrile; at lower pressure, the residual content of 2-methyl-3-butenenitrile in the top draw decreases and the content of the (Z)-2-methyl-2-butenenitrile to be removed in the tops increases.

Examples in the specification demonstrate unexpected results achievable by the present invention. Along these lines, the claimed process provides low losses of 2-methyl-3 butenenitrile during distillative separation of (Z) 2-methyl-2- butenenitrile (cf. example 1-4 of the present specification). This is surprising since the boiling points of both compounds differ only slightly from each other.

Moreover, the relative antiquity of Drinkard is further indicia of the non-obviousness of the present invention. Along these lines, please see In re Adams 148 USPQ 743 (CCPA, 1966) and In re Lechen, 125 USPQ 396 (CCPA, 1960).

In conjunction with interpreting 35 U.S.C. §103 under *Graham V. John Deere*, 383 U.S. 1, 148 U.S.P.Q. 459 (1966) and *KSR Int'l Co. v. Teleflex, Inc*, 127 S. Ct. 1727 (2007), the initial burden is on the Patent Office to provide some apparent reason or suggestion of the desirability of doing what the inventor did, i.e. the Patent Office must establish a *prima facie* case of obviousness. To support the conclusion that the claimed invention is directed to obvious subject matter, either the references must expressly or impliedly suggest the claimed invention, or the Examiner must present a convincing line of reasoning as to why the artisan would have found the claimed invention to have been

obvious in light of the teachings of the references. Moreover, MPEP, § 706.02(j), states that "To support the conclusion that the claimed invention is directed to obvious subject matter, either the references must expressly or impliedly suggest the claimed invention or the examiner must present a convincing line of reasoning as to why the artisan would have found the claimed invention to have been obvious in light of the teachings of the references. Also, please see *Ex parte Clapp*, 227 USPQ 972, 973 (Bd. Pat. App. & Inter. 1985).

In addition, the prior art reference (or references, when combined) must teach or suggest all of the claim limitations.

The mere fact that cited art may be modified in the manner suggested in the Office Action does not make this modification obvious, unless the cited art suggests the desirability of the modification or impliedly suggests the claimed invention, or the Examiner has presented a convincing line of reasoning as to why the artisan would have found the claimed invention to have been obvious in light of the teachings of the references. No such suggestion appears in the cited art in this matter nor has a convincing line of reasoning been presented in this case. The Board's attention in kindly directed to *KSR Int'l Co. v. Teleflex, Inc*, supra; *In re Dembiczak et al*, 50 USPQ2d.1614 (Fed. Cir. 1999), *In re Gordon*, 221 USPQ 1125 (Fed. Cir. 1984), *In re Laskowski*, 10 USPQ2d, 1397 (Fed. Cir. 1989) and *In re Fritch*, 23, USPQ2d. 1780 (Fed. Cir. 1992).

Furthermore, the cited art lacks the necessary direction or incentive to those of ordinary skill in the art to render a rejection under 35 USC 103 sustainable. The cited art fails to provide the degree of predictability of success of achieving the properties attained by the present invention needed to have a rejection under 35 U.S.C. 103 sustained. See *KSR Int'l Co. v. Teleflex, Inc*, 127 S. Ct. 1727 (2007), *Diversitech Corp. v. Century Steps, Inc.*, 7 USPQ2d 1315 (Fed. Cir. 1988), *In re Mercier*, 187 USPQ 774 (CCPA 1975) and *In re Naylor*, 152 USPQ 106 (CCPA 1966). In particular, the claimed process provides low losses of 2-methyl-3 butenenitrile during distillative separation of (Z) 2-methyl-2-

butenenitrile (cf. example 1-4 of the present specification). This is quite surprising since the boiling points of both compounds are only slightly different.

Moreover, the properties of the subject matter and improvements which are inherent in the claimed subject matter and disclosed in the specification are to be considered when evaluating the question of obviousness under 35 USC 103. See *KSR Int'l Co. v. Teleflex,*, *supra, Gillette Co. v. S.C. Johnson & Son, Inc.*, 16 USPQ2d 1923 (Fed. Cir. 1990), *In re Antonie*, 195 USPQ 6 (CCPA 1977), *In re Estes*, 164 USPQ 519 (CCPA 1970), and *In re Papesch*, 137 USPQ 43 (CCPA 1963).

No property can be ignored in determining patentability and comparing the claimed invention to the prior art. Along these lines, see *In re Papesch*, supra, *In re Burt et al*, 148 USPQ 548 (CCPA 1966), *In re Ward*, 141 USPQ 227 (CCPA 1964), and *In re Cescon*, 177 USPQ 264 (CCPA 1973).

VIII. CLAIMS

A copy of the claims involved in the present appeal is attached hereto as Appendix A. As indicated above, the claims in Appendix A include the amendments filed by Applicant on July 18, 2006.

Please charge any fees due with this paper to our Deposit Account No. 03-2775, under Order No. 12810-00322-US1 from which the undersigned is authorized to draw.

Dated: February 28, 2012

Respectfully submitted,

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APPENDIX A-CLAIMS ON APPEAL

Claims Involved in the Appeal of Application Serial No. 10/586,470

1. A process for preparing 3-pentenenitrile, comprising the following process steps:

(a) isomerizing a reactant stream which comprises 2-methyl-3-butenenitrile over at least one dissolved or dispersed isomerization catalyst to give a stream 1 which comprises the at least one isomerization catalyst, 2-methyl-3-butenenitrile, 3-pentenenitrile and (Z)-2-methyl-2-butenenitrile,

(b) distilling stream 1 at a pressure of 0.1 mbar to 100 bar to obtain a stream 2 as the top product which comprises 2-methyl-3-butenenitrile, 3-pentenenitrile and (Z)-2-methyl-2-butenenitrile, and a stream 3 as the bottom product which comprises the at least one isomerization catalyst,

(c) distilling stream 2 at a bottom temperature of 40 to 180°C and a pressure of 10 mbar to 500 mbar to obtain a stream 4 as the top product which, compared to stream 2, is enriched in (Z)-2-methyl-2-butenenitrile, based on the sum of all pentenenitriles in stream 2, and a stream 5 as the bottom product which, compared to stream 2, is enriched in 3-pentenenitrile and 2-methyl-3-butenenitrile, based on the sum of all pentenenitriles in stream 2,

(d) distilling stream 5 at a pressure of 0.001 bar to 100 bar to obtain a stream 6 as the bottom product which comprises 3-pentenenitrile and a stream 7 as the top product which comprises 2-methyl-3-butenenitrile, the (Z)-2-methyl-2-butenenitrile-depleted 2-methyl-3-butenenitrile being recycled to step (a).

2. The process according to claim 1, wherein the reactant stream is obtained by the following process steps:

(e) hydrocyanating 1,3-butadiene over at least one hydrocyanation catalyst using hydrogen cyanide to obtain a stream 8 which comprises the at least one hydrocyanation catalyst, 3-pentenenitrile, 2-methyl-3-butenenitrile, 1,3-butadiene and residues of hydrogen cyanide,

(f) distilling stream 8 one or more times to obtain a stream 9 which comprises 1,3-butadiene, a stream 10 which comprises the at least one hydrocyanation catalyst, and a stream 11 which comprises 3-pentenenitrile and 2-methyl-3-butenenitrile,

(g) distilling stream 11 to obtain a stream 12 as the bottom product which comprises 3-pentenenitrile, and a stream 13 as the top product which comprises 2-methyl-3-butenenitrile.

3. The process according to claim 2, wherein process step (d) and (g) are carried out in the same distillation apparatus, in which case streams 6 and 12 and streams 7 and 13 coincide.

4. The process according to claim 2, wherein process steps (c) and (g) are carried out in a common distillation column, in which case process step (d) is dispensed with, stream 2 from process step (b) and stream 11 from process step (f) are directed to process step (g), and, in process step (g), stream 4 is obtained as the top product comprising (Z)-2-methyl-2-butenenitrile, stream 12 as the bottom product comprising 3-pentenenitrile and stream 13 as a side draw stream comprising 2-methyl-3-butenenitrile.

5. The process according to claim 1, wherein the at least one isomerization catalyst obtained in stream 3 in process step (b) is recycled into process step (a).

6. The process according to claim 1, wherein process steps (b) and (c) are carried out together in one distillation apparatus, in which case stream 3 which comprises the at least one isomerization catalyst is obtained as the bottom product, stream 4 which comprises (Z)-2-methyl-2-butenenitrile as the top product, and stream 5 which comprises 3-pentenenitrile and 2-methyl-3-butenenitrile at a side draw of the column.

7. The process according to claim 1, wherein process steps (a), (b) and (c) are carried out together in one distillation apparatus, in which case stream 4 which comprises (Z)-2-methyl-2-butenenitrile is obtained as the top product, and stream 5 which comprises 3-pentenenitrile and 2-methyl-3-butenenitrile at a side draw of the distillation apparatus, and the isomerization catalyst remains in the bottom of the distillation column.

8. The process according to claim 1, wherein the isomerization catalyst contains nickel(0), a trivalent phosphorus-containing compound which complexes nickel(0) as a ligand and, optionally, a Lewis acid.

9. The process according to claim 1, wherein pressure and temperature in process step (b) are set so that the isomerization catalyst is less active than in process step (a) or is inactive.

10. The process according to claim 2, wherein the hydrocyanation catalyst and the isomerization catalyst are identical.

17. The process according to claim 1, wherein step (b) is carried out at a pressure of 1 mbar to 6 bar and a temperature of 25-250°C at the bottom of the distillation apparatus and a temperature of – 15 to 200°C at the top of the distillation apparatus; step (c) is carried out at a temperature of – 15 to 200°C at the top of the distillation apparatus; and step (d) is carried out at a pressure of .001 bar to 100 bar and a temperature of -30 to 250°C at the bottom of the distillation apparatus and a temperature of –50 to 250°C at the top of the distillation apparatus.

18. The process according to claim 1, wherein step (b) is carried out at a pressure of 10 mbar to 500 mbar and a temperature of 40-180°C at the bottom of the distillation apparatus and a temperature of 5 to 150°C at the top of the distillation apparatus; step (c) is carried out at a temperature of 5 to 150°C at the top of the distillation apparatus; and step (d) is carried out at a pressure of .01 bar to 20 bar and a temperature of 50 to 200°C at the bottom of the distillation apparatus and a temperature of 0 to 180°C at the top of the distillation apparatus.

19. The process according to claim 18, wherein step (b) is at a temperature of 60-140°C at the bottom of the distillation apparatus and a temperature of 10 to 100°C at the top of the distillation apparatus; step (c) is carried out at a temperature of 60-140°C at the bottom of the distillation apparatus and a temperature of 10 to 100°C at the top of the distillation apparatus; and step (d) is carried out at a temperature of 60 to 180°C at the bottom of the distillation apparatus and a temperature of 15 to 160°C at the top of the distillation apparatus.

20. The process according to claim 1, wherein step (b) is carried out at a pressure of 1 mbar to 6 bar; and step (d) is carried out at a pressure of .001 bar to 100 bar.

APPENDIX B

No evidence pursuant to §§ 1.130, 1.131, or 1.132 or entered by or relied upon by the examiner is being submitted.

APPENDIX C

A related proceeding is referenced in II. above, hence a copy of the Decision and Opinion in USSN 10/586,452 (Appeal 2010-005701) is provided herein.

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte TIM JUNGKAMP, ROBERT BAUMANN,
MICHAEL BARTSCH, GERD HADERLEIN,
HERMANN LUYKEN, and JENS SCHEIDEL

Appeal 2010-005701
Application 10/586,452
Technology Center 1600

Before DEMETRA J. MILLS, FRANCISCO C. PRATS, and MELANIE L. McCOLLUM, *Administrative Patent Judges*.

McCOLLUM, *Administrative Patent Judge*.

DECISION ON APPEAL[1]

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[1] The two-month time period for filing an appeal or commencing a civil action, as recited in 37 C.F.R. § 1.304, or for filing a request for rehearing, as recited in 37 C.F.R. § 41.52, begins to run from the "MAIL DATE" (paper delivery mode) or the "NOTIFICATION DATE" (electronic delivery mode) shown on the PTOL-90A cover letter attached to this decision.

This is an appeal under 35 U.S.C. § 134 involving claims to a separating process. The Examiner has rejected the claims as obvious. We have jurisdiction under 35 U.S.C. § 6(b). We affirm.

STATEMENT OF THE CASE

Claims 1-14 are pending and on appeal (App. Br. 2). The claims have not been argued separately and therefore stand or fall together. 37 C.F.R. § 41.37(c)(1)(vii). We will focus on claim 1, which reads as follows:

> 1. A process for separating mixtures of isomeric pentenenitriles, in which at least one isomer is depleted from the mixture, which comprises effecting the separation of the mixtures of isomeric pentenenitriles selected from the group consisting of
> - mixtures comprising 2-methyl-3-butenenitrile and 3-pentenenitrile,
> - mixtures comprising 2-methyl-3-butenenitrile and (Z)-2-methyl-2-butenenitrile,
> - mixtures comprising cis-2-pentenenitrile and 3-pentenenitrile
> by distilling under a pressure of from 0.01 to 0.5 bar and
> - mixtures comprising (E)-2-methyl-2-butenenitrile and 3-pentenenitrile
> by distilling under a pressure of from 0.02 to 0.5 bar.

Claims 1-14 stand rejected under 35 U.S.C. § 103(a) as obvious in view of Jungkamp et al. (WO 02/26698 A1, Apr. 4, 2002) (Ans. 3).

ISSUE

Has the Examiner set forth a prima facie case that the process of claim 1 would have been obvious and, if so, have Appellants provided sufficient evidence to rebut the prima facie case?

FINDINGS OF FACT

1. Jungkamp discloses:

> a process for the distillative separation of pentene nitrile isomers which have a relative volatility alpha ranging from 1.0 to 1.3 in the pressure range from 1 to 500 kPa, wherein the

> distillation is carried out in the presence of a liquid diluent which forms with the pentene nitrile isomers, under the same pressure conditions, azeotropes whose relative volatility alpha is higher than that of the pentene nitrile isomers to be separated.

(Jungkamp ¶ [0001][2].)

2. Jungkamp lists pentene nitrile mixtures for which the process is "[p]articularly suitable" (*id.* at ¶ [0014]).

3. Jungkamp also discloses that the "distillation can advantageously be carried out at a pressure ranging from 1 to 200 kPa, preferably from 50 to 100 kPa, and especially under atmospheric pressure" (*id.* at ¶ [0029]).

4. The Specification lists the relative volatility at atmospheric pressure of claimed mixtures as follows:

Pentenenitrile isomer pair	Relative volatility at atmospheric pressure
2-Methyl-3-butenenitrile / trans-3-pentenenitrile	1.72
cis-2-Pentenenitrile / trans-3-pentenenitrile	1.55
(E)-2-Methyl-2-butenenitrile / trans-3-pentenenitrile	1.19
2-Methyl-3-butenenitrile / (Z)-2-methyl-2-butenenitrile	1.12

(Spec. 1).

PRINCIPLES OF LAW

"[I]t is not inventive to discover the optimum or workable ranges by routine experimentation." *In re Aller*, 220 F.2d 454, 456 (CCPA 1955). "Only if the 'results of optimizing a variable' are 'unexpectedly good' can a patent be obtained for the claimed critical range." *In re Geisler*, 116 F.3d

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[2] The point citations to Jungkamp refer to its US equivalent -- US 2004/0039221 A1, Feb. 26, 2004.

1465, 1469 (Fed. Cir. 1997) (quoting *In re Antonie*, 559 F.2d 618, 620 (CCPA 1977)).

ANALYSIS

Jungkamp discloses "a process for the distillative separation of pentene nitrile isomers which have a relative volatility alpha ranging from 1.0 to 1.3 in the pressure range from 1 to 500 kPa" (Finding of Fact (FF) 1). Jungkamp lists pentene nitrile mixtures for which the process is "[p]articularly suitable" (FF 2). However, we agree with the Examiner that "[i]t would be obvious to one of ordinary skill to take the method proven by Jungkamp et al. and apply it to other mixtures of pentenenitrile isomers" (Ans. 4). In particular, it would have been obvious to apply Jungkamp's method to at least the mixtures encompassed by claim 1 that have a relative volatility alpha between 1.0 and 1.3 (*see* FF 4).

With regard to the claimed pressures, we agree with the Examiner that, "[e]ven though the Appellant[s] ha[ve] shown in the instant specification that distillation efficiency is increased at lower pressures, . . . the suggestion by Jungkamp et al. that the distillation may be done at lower pressures and the overall *prima facie* case for obviousness is stronger than the evidence of increased efficiency" (Ans. 7). In this regard, we note that Jungkamp discloses "a pressure ranging from 1 to 200 kPa" (FF 3), which as noted by the Examiner "contains the instantly claimed range of pressures" (Ans. 7). Moreover, Jungkamp discloses a preferred range of from 50 to 100 kPa (FF 3), which overlaps the claimed ranges at 0.5 bar (i.e., 50 kPa). Given these teachings, we do not find the data provided in the Specification sufficient to overcome the prima facie case.

CONCLUSION

The Examiner has set forth a prima facie case that the process of claim 1 would have been obvious and Appellants have not provided sufficient evidence to rebut the prima facie case. We therefore affirm the obviousness rejection of claim 1. Claims 2-14 fall with claim 1. 37 C.F.R. § 41.37(c)(1)(vii).

TIME PERIOD FOR RESPONSE

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a).

AFFIRMED

alw

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